

# Superior Speech Acquisition and Robust Automatic Speech Recognition for Integrated Spacesuit Audio Systems, Phase II

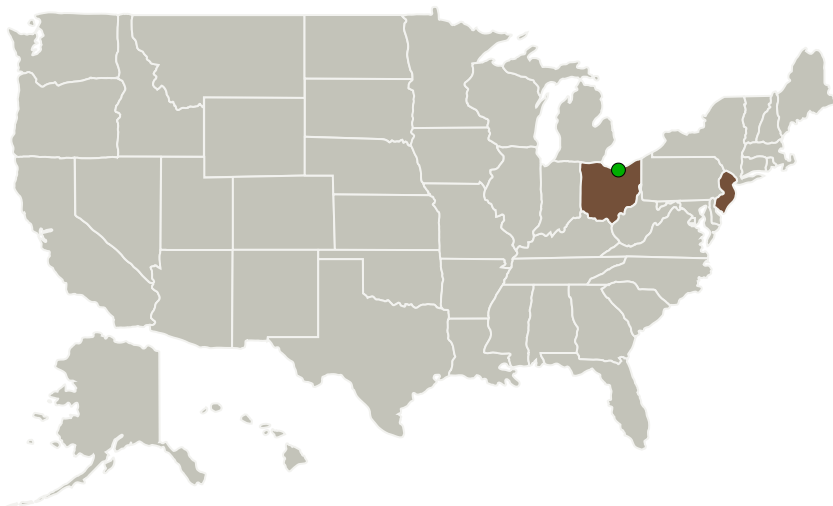
Completed Technology Project (2010 - 2012)



## Project Introduction

Astronauts suffer from poor dexterity of their hands due to the clumsy spacesuit gloves during Extravehicular Activity (EVA) operations and NASA has had a widely recognized but unmet need for novel human machine interface technologies to facilitate data entry, communications, and robots or intelligent systems control. The objective of this research project is to develop a speech human interface that can offer both crewmember usability and system operational efficiency. But loud noise and strong reverberation inside spacesuits make automatic speech recognition (ASR) for such an interface a very challenging problem. In Phase I, the feasibility of using WeVoice proprietary microphone array signal processing and robust ASR technologies was validated. In particular, it was found that novel multichannel noise reduction produces larger gain in SNR than conventional beamforming but the latter is more preferable as far as ASR is concerned. In addition, it was confirmed that the model adaptation algorithm can make an ASR system more robust inside spacesuits. An arithmetic complexity model for ASR was developed. It can direct the decision as to whether a specified speech interface is sufficiently efficient to be possibly implemented with a wearable system. Phase II will analyze and minimize the scientific and engineering uncertainties identified during Phase I. Furthermore, a voice command interface for future generations of a suit's processing system is proposed to be developed on DSP chips. The system should be ready for testing and use by NASA suited crewmembers at the end of Phase II.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
WEVOICE, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Bridgewater, New Jersey
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

## Primary U.S. Work Locations

New Jersey	Ohio
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## Project Transitions

▶ **January 2010:** Project Start

✓ **January 2012:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138706>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

WEVOICE, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

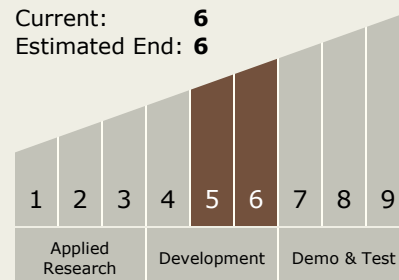
Carlos Torrez

### Principal Investigator:

Sherry Q Ye

## Technology Maturity (TRL)

Start: 5  
Current: 6  
Estimated End: 6



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## Technology Areas

### Primary:

- TX04 Robotic Systems
  - └ TX04.2 Mobility
    - └ TX04.2.4 Surface Mobility

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System